Statement of
Dr. Jared L. Cohon, Chairman
Nuclear Waste Technical Review Board
before the
Subcommittee on Energy and Power
Committee on Commerce
U.S. House of Representatives
April 29, 1997

Good Afternoon, Mr. Chairman. My name is Jared Cohon. I am here today in my role as Chairman of the Nuclear Waste Technical Review Board. My current full-time job is dean of the School of Forestry and Environmental Studies at Yale University. I was recently named President-elect of Carnegie Mellon University, where I will assume the duties of President on July 1 of this year.

Mr. Chairman, the Board has been asked to comment today on provisions of H.R. 1270. I will provide some very brief remarks and ask that the full text of my statement and the attachment to it be entered into the hearing record.

I will not attempt to comment on the specifics of every provision of H.R. 1270. I think the Board can be most constructive by clarifying for the record its suggestions on interim spent fuel storage, which were presented in the Board's March 1996 report. The issues addressed in the report are directly related to the bill's overall objectives.

But first, Mr. Chairman, I would like to take a moment to provide some context for the conclusions the Board reached in its report. Consistent with its mandate, established in the 1987 amendments to the Nuclear Waste Policy Act, the members of the Board take a long-term view of nuclear waste management. Our focus is on the technical validity of DOE activities related to determining the suitability of the Yucca Mountain site as the location of a permanent repository and the overall system for managing spent fuel and defense high-level waste. The Board is very aware that decisions such as the need for and timing of the development of centralized storage capability are policy decisions that should and will be made by policy makers in Congress and the administration. However, these decisions will have important implications for the technical aspects of the waste management system. We believe these technical considerations should inform the deliberations related to spent fuel storage options under review by policymakers. It was in this spirit that the Board offered its recommendations on spent fuel storage and that I appear before you today.

Let me be clear about what the Board said in its March 1996 report. The Board concluded that interim spent fuel storage is an essential component of an integrated nuclear waste management system, which includes a repository as the final disposal alternative. Furthermore, the Board said that a centralized storage facility should be collocated with an operating repository. The Board stated that there were no *technical reasons* to move spent fuel from nuclear utility sites for the next few years, while acknowledging that policy makers would have

to consider other nontechnical reasons for moving the waste. The Board noted that it will likely take several years to develop the transportation infrastructure necessary to begin moving significant amounts of waste. During this time a technically defensible decision could be made about the suitability of the Yucca Mountain site.

The Board made another observation that bears on the timing of a decision on centralized spent fuel storage. Making a final decision to build an interim storage facility at Yucca Mountain before the site's suitability can be determined, could call into question the objectivity of technical conclusions about Yucca Mountain and ultimately of any decision to build a repository there. The determination of Yucca Mountain's suitability for a permanent repository will hinge on results from highly technical analyses. Because we are dealing with periods of thousands of years, these results will include uncertainty, thus requiring technical judgments upon which conclusions will be drawn. The acceptability of these conclusions will depend, in part, on the public's confidence and trust in the objectivity of the process. A decision now to place spent fuel at Yucca Mountain, before suitability is determined, may call into question that objectivity on which a long-term solution depends.

Mr. Chairman, the Board recently commented on the proposed revision of DOE's siting guidelines (10 CFR part 960). These comments may be relevant to your deliberations on H.R. 1270. They are attached to my statement.

In addition, I would like to bring to your attention one provision of H.R. 1270 that directly affects the Board. Language included by the House Committee on Appropriations in the Board's appropriation for fiscal year 1996, would allow sitting members of the Board to serve after their terms have expired, until their replacements take office. This language is not included in H.R. 1270. Because of the small size of the Board and the breadth of expertise necessary for adequate review of this large and complex program, a vacancy on the Board can affect the comprehensiveness and quality of its evaluation. We would appreciate the Subcommittee's consideration for including this language in this, or any future, nuclear waste legislation.

In conclusion, Mr. Chairman, the Nuclear Waste Technical Review Board was created by Congress to provide unbiased and independent technical review of the permanent repository program. We believe the Board has discharged this responsibility well. As we move closer to key milestones and decision points, an independent source of technical advice will become even more important. The Board looks forward to continuing to fill that role.

Thank you, Mr. Chairman, for this opportunity to comment on H.R. 1270. I will be happy to answer any questions the Subcommittee may have.

April 15, 1997

Ms. April V. Gil
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Dear Ms. Gil:

The Nuclear Waste Technical Review Board appreciates the opportunity to comment on the proposed revisions to the Department of Energy's (DOE) General Guidelines for the Recommendation of Sites for Nuclear Waste Repositories (10 CFR 960).

The Board submits these comments as part of its responsibilities under the Nuclear Waste Policy Amendments Act to evaluate the scientific and technical validity of activities carried out by the Secretary of Energy and the DOE Office of Civilian Radioactive Waste Management. In doing so, it takes no position whatsoever on the legal issues that might be raised in regard to these revisions. Nor does it address the question of whether these revisions are consistent with the Nuclear Regulatory Commission's (NRC) licensing regulations, 10 CFR 60.

Background

If adopted, these guidelines will be used to evaluate the suitability of a specific repository design for the Yucca Mountain site. A demonstration that the repository system (including both natural and engineered features) complies with the guidelines will be the critical technical input to the President's decision to seek a license from the NRC to construct a repository. Thus, the Board recognizes that choices made now about the substance and the form of the guidelines are significant.

The current site-suitability guidelines advance a lengthy list of site characteristics and require that each be consistent with an overall system performance objective. In the case of some of the characteristics, a threshold test of acceptability also must be passed. Furthermore, the current guidelines appear to limit the degree to which engineered barriers can be relied upon to meet an overall system performance objective.

Under the revisions proposed by the DOE, the site-suitability determination would no longer depend on factors such as environmental quality, socioeconomics, and transportation. Nor would it require an evaluation of repository construction, operation, and closure. Instead, site suitability would be determined only by whether the *repository system* (natural and engineered barriers) can meet a post-closure performance standard that will be specified by the Environmental Protection Agency.

Although the current guidelines, in principle, could be used to determine the suitability of a specific site, the Board believes that there may be some practical limitations in applying them. Furthermore, the current guidelines obscure – although they are not inconsistent with – the fundamental importance of understanding how each characteristic of a repository affects its overall performance as a system. Linking suitability directly and unambiguously to system performance, the proposed revised guidelines seem to be a sounder approach. Indeed, the Board has emphasized overall performance in defining suitability for its own purposes as "a high probability that the site, along with appropriate engineered barriers, can provide long-term waste isolation." Thus, the Board believes that the proposed revisions to 10 CFR 960 represent a step in the right direction.

The DOE proposes to use the technique of performance assessment to determine whether the Yucca Mountain site is suitable. While that technique can be used to derive important insights, its application at Yucca Mountain has not fully matured. To date, efforts by the DOE to assess repository performance show clearly how complex the analysis of a repository system can be. Process models must be developed, and their key parameters have to be evaluated, either experimentally or through the use of informal or formal expert judgment. These individual models must then be combined into a single, integrated methodology to produce an estimate of the repository's performance. For each of the components of the analysis, methodological and empirical assumptions have to be made. Thus, uncertainties will unavoidably accumulate. They will be large, and they will become even larger as the time horizon for the performance projections reaches farther into the future.

Specific comments

The complaint that the proposed revisions to the guidelines "change the rules in the middle of the game" reflects, at least in part, fears that performance assessment may be manipulated to support any conclusion desired. With so much riding on a single set of calculations, it is difficult to dismiss those fears as illegitimate or unwarranted. For that reason, the Board believes that the DOE must modify its proposed revisions to 10 CFR 960 to strengthen confidence in the technical validity of the performance assessment in the following ways.

1. The DOE should show in its performance assessment that the repository system is designed in a manner that preserves the principle of defense-in-depth using multiple barriers. The current guidelines use "sub-system performance criteria," such as ground-water travel time and waste package release rates, in an attempt to ensure that multiple barriers contribute to waste isolation and containment in the repository system. Although the Board recognizes that subsystem criteria could be arbitrary and unworkable, it strongly believes that the principle of defense-in-depth using multiple barriers must be preserved. The Board would object if the prominence given

performance assessment in the proposed revised guidelines were to have the effect of diluting the DOE's commitment to that principle. The Board does not, however, wish to prescribe a particular mix of barriers that the DOE must adopt. Thus, in the Board's view, a site may be suitable even if the repository system placed there has to rely on engineered barriers for waste containment and isolation to a greater degree than was envisioned when the current guidelines were published.

Consequently, the Board believes that the proposed revisions should be modified to incorporate language requiring that performance assessment be used to show that defense-in-depth plays an important role in the performance of a repository system. In particular, the DOE should:

- Clearly articulate and provide empirical support for the hypotheses that underlie an explicit strategy for using defense-in-depth to secure waste containment and isolation.
- Show that the repository design contains significant redundancy so that more than one independent barrier contributes to the capability of the repository system to contain and isolate waste over the period of compliance.
- Assess the relative roles played by natural and engineered barriers, as well as analyzing their potential interactions.

2. The DOE should add a requirement that performance assessment not only show that the repository system complies with a standard, but that it does so robustly. A conclusion will more likely be accepted as robust if:

- Uncertainties are fully and accurately addressed.
- Sensitivity studies are carried out to show the effects of higher or lower values of variables.
- Compliance is shown with a margin of safety.

A robust conclusion about the performance of a repository system should be better able to withstand challenges brought about by new knowledge and changing assumptions.

3. The DOE should specify the level of confidence that must be reached in its performance calculations before it is prepared to make a positive site-suitability determination. Underlying the DOE's proposed revisions to the guidelines appears to be the implicit presumption that clear and obvious conclusions can be drawn from the performance assessment. As noted above, the Board believes that a performance assessment may, in fact, produce values that have substantial uncertainty bands around them, especially if the assessment is carried out in a manner consistent with the recommendations included in this letter. Therefore it is essential that the DOE specify in advance the level of confidence needed to make a positive site-suitability determination. That level should be expressed quantitatively whenever possible, although only a qualitative definition may be feasible in some areas.

This acceptable level of uncertainty is a policy judgment that is clearly the DOE's to make. The Board believes that the credibility of the process would be increased if interested parties were involved in making that call. But the DOE should provide sufficient explanation for whatever level it decides upon so that those affected have a clear understanding from the start about how the DOE will use the performance assessment's conclusions to make decisions.

4. The DOE should add a requirement that the performance assessment be carried out in a manner that is highly transparent to the technical community, regulators, and interested members of the general public. By transparent, the Board means the ease of understanding (1) the process used to carry out the performance assessment, (2) the assumptions that drive the assessment's conclusions, and (3) the rigor of the analyses that lead to the assessment's conclusions. A performance assessment will likely be more transparent if:

- Assumptions and methodologies used in the analyses are clearly and explicitly identified, the bases for them are clearly explained, and their impact on the assessment's conclusions are clearly presented.
- Key parameters and their distributions can be traced back to specific experiments and investigations or to judgments, either formal or informal.
- It has undergone independent and comprehensive outside review.

Among the mechanisms the DOE might use to increase transparency for the technical and regulatory communities are well-documented expert elicitations and independent peer reviews. To increase transparency for the interested and affected members of the public, the DOE should consider using processes that are modeled on the lines suggested in the recent report from the National Academy of Sciences, *Understanding Risk*.

5. The DOE should formally connect its site-suitability determination to a larger and public process for making the decision whether to recommend to the President that Yucca Mountain be developed as a repository. Without such a process, it will be difficult to develop a broad national consensus that Yucca Mountain is "safe enough." While its postclosure performance is a central consideration in the evaluation of a repository system, additional considerations also need to be assessed and appropriately weighed. Those considerations include the cost of building the repository in the host formation, the environmental consequences of constructing a repository, the socioeconomic effects on surrounding communities, and the transportation risks involved in shipping waste to the site. It is essential that whatever process is adopted by the DOE does not foreclose at the start a decision *not to recommend* the development of the Yucca Mountain site based upon those site-specific considerations.

Again, the Nuclear Waste Technical Review Board appreciates this opportunity to comment on the proposed revisions to 10 CFR 960.

Sincerely,

Jared L. Cohon
Chairman